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| 09/995,662 | 11/29/2001 | Robert Harold Bateman | DEH009 | 2640 |

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| EXAMINER |
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| ART UNIT | PAPER NUMBER |
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| 2881 | |

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Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/995,662 | BATEMAN ET AL. | |
| | Examiner | Art Unit | |
| | Christopher M. Kalivoda | 2881 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-24 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-24 is/are rejected.

7)☒ Claim(s) 1,20 and 24 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 29 November 2001 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3,6,7 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Priority*

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### *Claim Objections*

Claims 1, 20, and 24 are objected to because of the following informalities: There are several pressure groups listed; however, there is a typo in the order of the Roman numbers starting after Roman numeral vi. Roman numeral vii is missing. Appropriate correction is required.

### *Drawings*

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: Figures 2, 3, and 4 show reference sign 5 that is not addressed in the specification. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 - 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith, et al. U.S. Patent 6,107,628 in view of Franzen, U.S. Patent 5,815,055. Regarding claims 1, 8, 9, 20, and 24, Smith et al. teaches a mass spectrometer comprising:

a. an ion source for producing ions (see column 4, lines 6-12 "ion funnel");

b. an input vacuum chamber comprising at least one AC-only ion guide for transmitting said ions, said AC-only ion guide comprising a plurality of electrodes having apertures, said apertures being aligned so that ions travel through them as they are transmitted by said ion guide (see column 4, lines 12-28 and figure 5 and column 5, lines 11-13). In addition, Smith, et al. teach the use of a series of ion funnels (see column 6, lines 56-60)

c. an analyzer vacuum chamber comprising an ion mass analyzer disposed to receive ions after they have been transmitted by said ion guide (see column 5, lines 40-46);

d. at least one differential pumping apertured electrode though which ions may pass, said at least one differential pumping apertured electrode being disposed between said input vacuum chamber and said analyzer vacuum chamber to permit said analyzer vacuum chamber to be maintained at a lower pressure than said input vacuum chamber (see column 1, line 59-64 and column 2, lines 1-4);

e. at least one alternating current (AC) generator connected to an input chamber reference potential for providing AC potentials to said plurality of electrodes (see column 4, lines 35-39); wherein:

f. at least 90% of said plurality of electrodes forming said AC-only ion guide are connected to said AC generator in such a way that at any instant during an AC cycle of the output of said AC generator, adjacent ones of said electrodes are supplied respectively with approximately equal positive and negative potentials relative to said input chamber reference potential (see column 4, lines 39-42); and

g. wherein said input vacuum chamber is arranged to be maintained at a pressure selected from the group consisting of. (i) $\geq$0.1 mbar; (ii) $\geq$0.5 mbar; (iii) $\geq$ 0.7 mbar;(iv) $\geq$1.0 mbar; (v) $\geq$1.3 mbar; (vi) $\geq$1.5 mbar; (viii) $\geq$2.0 mbar; (ix) $\geq$2.5 mbar; (x)$\geq$ 3.0 mbar; (xi) $\geq$3.5 mbar; (xii) $\geq$4.0 mbar; (xiii) $\geq$4.5 mbar; (xiv) $\geq$5.0 mbar; (xv) $\geq$6.0 mbar; (xvi) $\geq$7.0 mbar; (xvii) $\geq$8.0 mbar; (xviii) $\geq$9.0 mbar; (xix) $\geq$10.0 mbar; (xx) $\geq$1-5 mbar; (xxi) $\geq$1-2 mbar; (xxii) $\geq$0.5-1.5 mbar; (xxiii): $\geq$20 mbar; and (xxiv): $\geq$30 mbar (see column 4, lines 62-65).

However, Smith, et al. is silent with respect to at least 90% of said apertures are substantially the same size. In this invention, the electrodes form a funnel that is a modification to a stacked ring ion guide.

Franzen teaches that it is necessary to reduce substance and ion losses in all steps from ion generation measurement (see Franzen, column 1, lines 22-26).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Smith, et al. to include varying the number of electrodes, using the same size diameters or different size diameters in the electrodes, and varying the length and operating pressures to reduce losses.

The motivation for modifying the Smith et al. invention would be to arrive at a useful mass spectrometric result (see Franzen, column 1, lines 22-26).

Regarding claim 2, Smith et al. in view of Franzen teaches a mass spectrometer as claimed in claim 1 wherein the electrodes comprise a plate having an aperture therein (see Figure1).

Regarding claim 3, Smith et al. in view of Franzen also teach a mass spectrometer as claimed in claim 1 wherein the electrodes comprise a wire or rod bent to form a substantially closed ring (see column 4, lines 15-17).

Regarding claim 4, Smith et al. in view of Franzen teaches mass spectrometer as claimed in claim 1, wherein alternate ones of said electrodes are connected to each other and to one of the output connections of a single AC generator (see column 4, lines 35-39).

Regarding claims 5, Smith et al. in view of Franzen teaches a mass spectrometer as claimed in claim 1, wherein the AC-only ion guide comprises at least 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, 70, 80, 90, or 100 electrodes (see Figure 3).

Regarding claim 6, Smith et al. in view of Franzen teaches a mass spectrometer as claimed in claim 1, wherein said electrodes have internal diameters or dimensions selected from the group consisting of. (1) $\leq$ 5.0 mm; (ii) $\leq$ 4.5 mm; (iii) $\leq$ 4.0 mm; (iv) $\leq$ 3.5 min; (v) $\leq$ 3.0 mm; (vi)$\leq$ 2.5 mm; (vii) 3.0 $\pm$ 0.5 mm; (viii) $\leq$ 10.0 mm; (ix) $\leq$ 9.0 mm; (x) $\leq$ 8.0 mm; (xi) $\leq$ 7.0 mm; (xii) $\leq$ 6.0 mm; (xiii) 5.0 $\pm$ 0.5 mm; and (xiv) 4-6 mm (see column 11-12 Table 1 inner diameters).

Regarding claim 7, Smith et al. in view of Franzen teaches a mass spectrometer as claimed in claim 1, wherein the length of said AC only ion guide is selected from the group consisting of: (1) $\geq$100 mm; (ii) $\geq$120 mm; (iii) $\geq$150 mm; (iv) 130 $\pm$ 10 mm; (v) 100-150 mm; (vi)$\geq$ 160 mm; (vii) $\geq$ 180 mm; (viii) $\geq$ 200 mm; (ix) 130-150 mm; (x) 120-180 mm; (xi) 120-140 mm; (xii) 130 mm $\pm$ 5, 10, 15, 20, 25 or 30 mm); (xiii) 50-300

mm; (xiv) 150-300 mm; (xv) $\geq$ 50 mm; (xvi) 50-100 mm; (xvii) 60-90 mm; (xviii) $\geq$ 75 mm; (xix) 50-75 mm; (xx) 75-100 mm; (xxi) 150-200 mm; (xxii) $\geq$ 200 mm; and (xxiii) 50-200 mm (see column 11, lines 35-39). In this version, there were 28 electrodes, each 1.59 mm thick. The total length must therefore be at least 44.52 mm and does not include the spaces separating each electrode.

Regarding claims 10, Smith et al. in view of Franzen teaches a mass spectrometer as claimed in claim 5, wherein the AC-only ion guide comprises at least 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, 70, 80, 90, or 100 electrodes (see Figure 3).

Regarding claim 11, Smith et al. in view of Franzen teaches a mass spectrometer as claimed in claim 8, wherein said intermediate vacuum chamber is arranged to be maintained at a pressure selected from the group consisting of: (i) $10^{-3}$ - $10^{-2}$ mbar; (ii) $\geq$ 2 x $10^{-3}$ mbar; (iii) $\leq$ 5 x $10^{-3}$ mbar; (iv) $\leq$ $10^{-2}$ mbar; (v) $10^{-3}$ -5 x $10^{-3}$ mbar; and (vi) 5 x $10^{-3}$ - $10^{-2}$ mbar (see column 1, lines 64-67 and column 2, lines 1-4 and figure 8A).

Regarding claim 12, Smith et al. in view of Franzen teach a mass spectrometer as claimed in claim 8, wherein said electrodes have internal diameters or dimensions selected from the group consisting of. (1) $\leq$ 5.0 mm; (ii) $\leq$ 4.5 mm; (iii) $\leq$ 4.0 mm; (iv) $\leq$ 3.5 min; (v) $\leq$ 3.0 mm; (vi)$\leq$ 2.5 mm; (vii) 3.0 $\pm$ 0.5 mm; (viii) $\leq$ 10.0 mm; (ix) $\leq$ 9.0 mm; (x) $\leq$ 8.0 mm; (xi) $\leq$ 7.0 mm; (xii) $\leq$ 6.0 mm; (xiii) 5.0 $\pm$ 0.5 mm; and (xiv) 4-6 mm (see column 11-12 Table 1 inner diameters).

Regarding claim 13, Smith et al. in view of Franzen teaches a mass spectrometer as claimed in claim 8, wherein the length of said AC only ion guide is selected from the group consisting of: (1) ≥100 mm; (ii) ≥120 mm; (iii) ≥150 mm; (iv) 130 ± 10 mm; (v) 100-150 mm; (vi)≥ 160 mm; (vii) ≥ 180 mm; (viii) ≥ 200 mm; (ix) 130-150 mm; (x) 120-180 mm; (xi) 120-140 mm; (xii) 130 mm ± 5, 10, 15, 20, 25 or 30 mm); (xiii) 50-300 mm; (xiv) 150-300 mm; (xv) ≥ 50 mm; (xvi) 50-100 mm; (xvii) 60-90 mm; (xviii) ≥ 75 mm; (xix) 50-75 mm; (xx) 75-100 mm; (xxi) 150-200 mm; (xxii) ≥ 200 mm; and (xxiii) 50-200 mm (see column 11, lines 35-39). In this version, there were 28 electrodes, each 1.59 mm thick. The total length must be at least 44.52 mm and does not include the spaces separating each electrode.

Regarding claim 14, Smith et al. in view of Franzen teaches a mass spectrometer as claimed in claim 1, wherein said ion source is an atmospheric pressure ion source (see column 3, lines 61-63).

Regarding claim 16, Smith et al. in view of Franzen teaches a mass spectrometer as claimed in claim 1, wherein said ion source is an Electrospray ("ES") ion source or an Atmospheric Pressure Chemical ionization ("APCI") ion source (see column 8, line 28 and 29).

Regarding claim 19, Smith, et al. in view of Franzen teaches a mass spectrometer as claimed in claim 1, wherein said ion mass analyzer is selected from the group consisting of: (i) a time-of-flight mass analyzer, preferably an orthogonal time of flight mass analyzer; (ii) a quadrupole mass analyzer; and (iii) a quadrupole ion trap (see column 1, line 38-42).

Regarding claims 15, 17, and 18, Smith et al. in view of Franzen teaches the limitations of claim 1 as described above. However, the Smith, et al. is silent with respect to these specific ion sources in these claims.

Franzen teaches the use of various types of ion sources including Electrospray Ionization, Atmospheric Pressure Chemical Ionization, Inductively Coupled Plasma, and Matrix Assisted Laser Desorption Ionization (see column 1, lines 40-60).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the ion source of Smith, et al. to include the use of APCI, ICP or MALDI.

The motivation for such a modification would be to use the proper ion source for the type of materials being analyzed (see column 1, lines 40-60).

Regarding claim 21 and 22, Smith et al. in view of Franzen teaches the limitations of claim 1. However, Smith, et al. is silent with respect to the AC-only ion guide comprising two interleaved comb arrangements, each said comb arrangement comprising a plurality of electrodes having apertures.

Franzen teaches the use of interleaved comb arrangements comprising longitudinally extending members having a plurality of electrodes having apertures (see column 5, lines 21-31 and figure 3, reference sign 3 and 4). In this instance, there are 6 interleaved comb structures for the 6 different phases and reference signs 3 and 4 correspond to the leads for each phase.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Smith, et al. such that the AC-only ion guide comprises two interleaved comb arrangements, each said comb arrangement comprising a plurality of electrodes having apertures.

The motivation for such a modification would be to simplify the electrical connections to the individual electrodes, especially when there are a great many of electrodes being used (see column 3, lines 16-31). Since there are several phases being used and several electrodes, this design simplifies the setup.

Regarding claim 23, Smith, et al. in view of Franzen teaches the limitations of claim 22. However, Smith, et al. is silent with respect to said input vacuum chamber has a length and said comb arrangement extends at least x% of said length, x% selected from the group consisting of: (i) $\geq$ 50%; (ii) $\geq$ 60%; (Iii) $\geq$ 70%; (iv) $\geq$ 80%; (v) $\geq$ 90%; and (vi) $\geq$ 95%.

Franzen teaches that it is necessary to reduce substance and ion losses in all steps from ion generation measurement (see Franzen, column 1, lines 22-26).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Smith, et al. to include varying the number of electrodes, using the same size diameters or different size diameters in the electrodes, and varying the length and operating pressures.

The motivation for modifying the Smith et al. invention would be to arrive at a useful mass spectrometric result (see Franzen, column 1, lines 22-26).

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher M. Kalivoda whose telephone number is (703)-305-7443. The examiner can normally be reached on Monday - Friday (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (703)-308-4116. The fax phone numbers for the organization where this application or proceeding is assigned are (703)-872-9318 for regular communications and (703)-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

cmk
April 10, 2003

JOHN R. LEE
SUPERVISORY PATENT EXAMINER
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